chronological register of mythological times:—if the latter, the names of the reigning monarchs are omitted as immaterial, and the simple fact announced, "in the year so and so, so many reigns;"—but even this is conjectural, and unless errors have been committed in copying the figures, they do not run in any seeming order. The word *sakkarák* is the Talain rendering of the Sanscrit *sakaráj*, year; in Barmese written *sakkarěj*: the terms *lrí kun* and *nhañ* are unknown to my informant. J. P. *Sec.*

V.—*On the Revolution of the Seasons. By the Rev.* R. Everest.

In the Journal of April 1835, I gave the result of a comparison of the amount of rain-fall at Calcutta, with different positions of the moon, as far as regards her declination. The averages shew that a greater quantity of rain fell on the days when the declination was large, say from 20° to 28°, than when it was small. Now, as there are some years in the lunar cycle in which the declination never reaches to 20°, it followed, as a probable, though not a necessary, inference, that in those years there would be a deficiency of rain. Shortly afterwards I met with this note, (Humboldt's New Spain, translated by Black, vol. ii. page 86.) "Toaldo pretends to be able to deduce from a great number of observations, that the very rainy years, and consequently the great inundations, return every 19 years according to the terms of the cycle of Saros—*Rozier, Journal de Physique* 1783." The recurrence seems here spoken of as an exploded error. I have therefore used whatever means lay within my reach to obtain information as to what really has been the variation of the seasons in this country for a long time back, and I will now state the results. But I must first premise respecting the note just quoted, that great inundations are not a necessary consequence of very rainy years. Should the rain fall regularly or equably, it will be less likely to occasion an inundation, than a much less quantity falling in a very short time. This will be more particularly the case in rocky and mountainous countries, where the channels are more easily choaked. In wide-extended plains, like those of the Nile and the Ganges, the rise of the river will form a more probable criterion of the amount of the rainy-season, though not a certain one. To revert, however, to the point proposed. The year 1829, was that of the minimum declination of the moon, and from the early part of 1827, to the end of 1831, the declination is never stated in the Almanacks at above 20°. For this, or rather for a period somewhat more extended, viz. from 1826 to 1833, inclusive, we have the following facts recorded.

1826, 1827, 1828, 1829, } Great drought in N. S. Wales; Lieut. Brereton's Travels.

1832. Public prayer by the Emperor of China for rain on account of extraordinary drought. Minimum of rain by Calcutta Register.

1833. Great drought through all the Upper Provinces, extending from Bundelkhand to Kashmir.

Let us next turn to Mr. Kyd's Register of the Height of the Huglí, (see Journal, April, 1835;) and as that has been objected to as evidence, I must be allowed to say a word in its defence. It is true that the level of the Huglí at Calcutta is affected by the tides in the Bay; but according to Mr. Kyd's account, such an occurrence is very rare, an inundation from the sea not happening more than once in a century. Remembering then that the ninth year before 1829 or 1820, was that of the moon's maximum declination, we find that the three or four years immediately before or after that were higher, on the average, than those farther off. Again, if we take 1811, the ninth year before 1820, and 18 years before 1829, we find that in the years nearest to it the river was lower than in those farther off. If we take the joint evidence of the height of the river, and the Calcutta register, we may assume that 1813 was the minimum year of rain; the 10th year after that or 1823, was the maximum year of rain: and in the ninth year again after that, or in 1832, came a minimum again; a period of 19 years, or a complete lunar cycle, having intervened between one minimum and its succeeding one.

With a view of ascertaining whether such a variation held in other localities, I obtained from the collector's office here, a memorandum of the character of the seasons as to rain for 21 years back. It was dictated from memory by an old native officer of the establishment, who would of course have the records of the office to refer to; and these in a climate where the crops depend so much upon the quantity of rain, would of themselves be a tolerable guide.

It begins thus: 1812, great drought; 1813, moderate; 1814 to 1823, (both inclusive, a period of 10 years,) four years very abundant, four years, abundant, two years moderate. From 1824 to 1833, (both inclusive, a period of 10 years,) one year very abundant, two years abundant, three years moderate, three years, drought; one year, 1833, great drought. The seasons of great drought are here placed 21 years apart, instead of 19, as in the former case. Evidence of this kind, like that from the height of the river, though not free from objection, can hardly be deemed unworthy of credit, when it is corroborated from other sources. There is one advantage, however, which information of the two kinds above-mentioned, possesses over the results of a solitary rain-guage, however carefully kept, viz. that they are an index, imperfect as they may be, to what has happened over a large tract of country; whereas the rain-guage can only inform us as to one particular spot, and rain-guages in general are so much affected by peculiarities of situation, that the results afforded by any one singly, must be considered as liable to doubt. To obviate this objection, I have placed together in a table all the different series procurable, of a date posterior to 1820, (see Table No. 1.) Most of them are to be found in the different Nos. of the Journal; and the localities are between Dacca, (E. Long. 90°,) and Delhi, (E. Long. 78°,) between Nagpur, (Lat. 21°, North,) and Delhi, 28° 40′ (N.) To these are added the observations at Madras, which I have obtained through the kindness of the Astronomer there; at Macao, in China, (Journal, July, 1832,) and at Edinburgh, (see Brewster's Philosophical Journal, passim.) In Table No. 2, are given the only three series that I have for the years between 1800 and 1821. The two first (Madras and Macao) are merely the preceding parts of the series given in Table 1. The last from Carlsruhe, in Sweden, is given in the Edinburgh Philosophical Journal for 1821, there quoted from the Bibliotheque Universelle for November, 1820. The original appears to be given in French inches and lines, and I have not reduced them to English measure, as the doing so would not affect the question at issue, viz. whether some years of the lunar cycle are more rainy than others. Now to make a more correct comparison of the different years, we must first reduce the numbers given in Table 1. to a common mean. Thus, we have Dacca for eight years, (1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834,) and the mean of the different sums given is 72·80 inches; at Calcutta, for the same eight years, the mean is 60·37 inches. The difference between these, 12·43 inches, we may reasonably suppose to be owing to the localities. Subtract, therefore, from each item of the Dacca series, the mean difference 12·43; the remainders will be reduced to the mean of Calcutta*. Proceed in a similar way with the other series, only of course where the climate is drier than that of Calcutta, the mean difference must be added, and not subtracted. The series in Table No. 2, may be included in the comparison by treating them in a similar way, and then considering them only according to their position in the lunar cycle. Thus, if we take 1821 for the first year of the cycle, 1803 (or the eighteenth year before that) may also be reckoned as the first year; 1802 and 1820, will of course be the last years. Place the whole in columns numbered according to their distance from 1802 and 1820, and an average may be taken of the whole, as in Table, No. 3. From this it appears that the average of nine years nearest the maximum is 66·34 inches, and of nine years nearest the minimum, 61·21 inches, making a difference of 5·13, or nearly $\frac{1}{13}$th of the whole between the two periods. If it be objected, that such a difference is too trivial to be decisive, we may answer that the difference shewn in the table is less than the real one. In all the series, except those of Dacca and Macao, a quantity has been added to bring them to the mean of Calcutta, and of course where two quantities differ, and a third quantity is added to each, they are brought nearer to a ratio of equality*.

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* The more correct mode would be to multiply the Dacca series by $\frac{60{\cdot}37}{72{\cdot}80}$. —Ed.

Secondly, if we consider each series separately, (see Tables 1. and 2,) we shall find that each confirms the opinion of the years of maximum declination being the most rainy, except the Macao one, in which the reverse holds good. Thus the average of 1812, 1813, 1814, and 1815, (four years near the minimum,) is 80·50 inches. That of 1816, 19, 20, 21, 22, 23, 24, (seven years about the maximum,) is 61·46. Again, that of 1825, 26, 27, 28, 29, 30, 31, (seven years about the minimum,) is 71·00 inches. So that this guage, as well as the others, favours the idea of a recurrence contemporaneous with the recurrence in the lunar cycle. We may here remark, that the idea of certain localities reciprocating, or experiencing at the same time contrary variations of climate, appears, at first sight, more probable than that the quantity of precipitation over the whole globe should be abundant for a series of years, and then deficient, the great cause of evaporation, viz. the heating power of the sun, remaining all the while the same.

It will be noticed, that among the series are two from northern Europe (Edinburgh and Carlsruhe). The inference might have been drawn without them, but they were added, as being the only others of any length I had at hand, to complete the cycle. Notwithstanding the testimony of the Swedish guage, it is very doubtful whether such a variation as is there shewn is general over Europe. I say so: First. Because of the way in which the idea is treated in the note from HUMBOLDT above quoted. Secondly. From the silence of modern writers in meteorology respecting it. Thirdly. What English registers I have been able to examine (and they are for short periods, not above three or four years) do not shew a preponderance of rain towards the maximum declination of the moon, but rather the reverse; so that, from that, as well as from other sources of information, we might conjecture the variations there would rather agree with those of the Macao guage, than of the Indian ones.

In naming the places visited, either just before, or after the year 1829, by drought, the following was omitted: "During the three years prior to 1834, there had been a complete drought, which had brought a famine upon these islands, and, in consequence, some thousands of the inhabitants had died."—Sketches of Cape de Verd Islands.—United Service Journal, July, 1835. As these islands lie in a latitude between that of Calcutta and Madras, the fact is interesting, but I have no accounts to refer to for the state of things during that period, in the intervening countries of Egypt, Abyssinia, Arabia, and Persia.

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* This would have been obviated by following the course mentioned in the note, page 283.—ED.

Lastly. It will be objected, that a regularly ascending and descending series has not been made out.

This is true; but as the number of series from which to take the averages has increased, so has the tendency to it become more apparent. There is one circumstance, however, which may serve to prevent a regular ascent and descent from ever becoming perceptible, viz. the place of the perigee. Having been lately engaged in an examination of barometric heights with regard to this, I have noticed that the average amount of variation from the mean, either in excess or defect, is greater about the time of perigee, as it also is about that of maximum declination. Now there are some years in which the day of perigee coincides about the solstices with that of maximum declination, and these years are usually the extreme ones, both of moisture and drought. I subjoin a sample.

	Perigee and Max. NorthDecl. 1814-1815.	Perigee and Max. South Decl 1818-1819.	Perigee and Max. South Decl. 1822-1823.	Perigee and Max. South Decl. 1826-1827.	Perigee and Max. North Decl. 1831-1832.
Calcutta,			77·2	55·42	50·25
Madras,	32.27	77·08 27·62	26·61	88·67	20·07
Macao,	95·70		55·70	51·80	

The three numbers in the Calcutta guage are, one, the highest, and two the lowest up to 1833; the six numbers in the Madras guage are the four minima and two maxima noted up to the same period. Of the three numbers from the Macao guage, one only is an extreme, but the other two are very large either way. Some other circumstances, also, would lead to the belief, that peculiar localities receive the changes both of drought and moisture earlier than others. Thus the last drought was at its height in Bengal in 1832, and also at Madras; but it did not reach either Delhi or the Nilgherries to the westward until 1833. This of course introduces a new source of confusion.

There is one other way of attempting to trace the variation of the seasons, and that is by a comparison of the prices of corn in different years at different places; but this must be deferred for the present.

Table No. 1.

Shewing the Annual Sums of Rain in inches that have fallen in different places in different years since 1820.

	1821	1822	1823*	1824*	1825	1826*	1827	1828	1829	1830	1831	1832	1833	1834	1835
Calcutta,........	..	..	77·20	67·30	..	55·42	64·56	57·29	59·73	63·24	58·78	50·25	60·36	68·73	85·50
Dacca,..........	..	..	..	..	..	..	74·00	46·80	80·80	93·90	89·00	66·70	62·80	68·00	..
Bancoora, ...	..	..	..	..	..	..	..	..	..	46·78	69·57	57·68	43·62	..	..
Nagpore, ...	..	..	..	..	..	65·61	53·99	46·61	50·25	33·00	65·31	37·14	..	..	..
Sagur,..........	..	..	..	..	..	..	..	31·20	46·60	32·00	64·80	..	..	..	..
Futtehpoor, ...	..	..	..	..	..	..	42·83	33·72	26·28	42·45	..	..	..	..	..
Delhi,..........	..	..	..	..	..	..	..	..	..	..	..	..	14·1	36·85	27·70
Madras, ...	47·12	58·84	26·61	33·21	55·94	60·71	88·67	37·89	37·09	34·41	40·30	20·07	36·95	40·17	37·26
Macao,..........	68·60	63·60	55·70	68·60	73·30	79·80	51·80	104·60	59·30	52·90	75·30	..	..9	..	..
Edinburgh,......	..	..	..	24·64	22·42	15·27	32·59	25·23	29·86	35·20	24·83	..	..	..	..

Note.—In the years marked with an asterisk the Calcutta Registers are partially defective, and have been supplied from the averages.

Table No. 2.

Shewing the Annual sums of Rain that have fallen at different places in 20 years previous to 1821.

	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820
Madras, ...	..	..	66·10	31·11	31·21	61·46	54·22	..	..	..	..	..	45·65	32·27	53·55	40·07	63·72	77·08	27·62	70·09
Macao, ...	..	..	..	..	..	..	..	..	..	..	..	107·30	54·50	95·70	64·50	48·80	..	..	59·00	65·90
Carlsruhe, ..	33·80	24,00	28·00	30·10	28·70	26·60	..	26·00	25·50	26·00	21·60	21·00	25·10	19·24	19·40	31·06	26·51	21·84	..	..

TABLE No. 3.

Shewing the comparative quantities of Rain that fell in different places in different years of the Lunar Cycle, the years 1803 *and* 1821, *(or those next after that of Maximum Declination,) being taken as the first of the Cycle, and the whole being reduced to the mean of Calcutta.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Calcutta,........	..	..	77·20	67·30	..	55.42	64·56	57·29	59·73	63·24	58·78	50·25	60·36	68·73	85·50	..	..	..
Dacca,..........	..	..	..	..	..	..	61·57	34·37	68·37	81·47	76·57	54·27	50·37	55·57	..	..	..	..
Bancoora, ...	..	..	..	..	..	..	..	..	..	50·53	73·32	61·43	47·37	..	..	..	..	..
Nagpore,........	..	..	..	..	..	72.66	61·04	53·66	57·30	40·05	72·36	44·19 39·86	} *					
Sagur, ...	..	..	..	..	..	..	..	47·31	62·71	48·11	80·91	..	..	..	..	..	..	..
Futtehpore, ...	..	..	..	..	..	..	67·71	58·60	51·16	67·33	..	..	..	..	..	..	..	..
Delhi, ...	..	..	..	..	..	..	..	..	..	..	..	..	59·48	82·18	73·03	..	..	..
Edinburgh, ...	..	..	..	58·74	56·52	49.37	66·69	59·33	63·96	69·30	58·93	..	..	..	..	..	..	..
Madras, ... {	83·38	48·39	48·49	78·74	71·50	..	..	..	..	..	62·93	49·95	70·83	57·35	81·00	94·36	44·90	87·37
	64·40	76·12	43·89	50·49	73·22	77.99	105·95	55·17	54·37	51·69	57·58	37·35	54·27	57·45	54·54	..	..	..
Macao, ... {	..	..	..	..	..	..	..	..	..	101·30	48·50	89·70	58·50	42·80	..	..	53·00	59·90
	62·60	57·60	49·70	62·60	67·30	73·80	45·80	98·60	53·30	46·90	69·30	..	..	..	..	..	..	..
Carlsruhe,.......	66·24	68·34	66·94	64·84	..	64'24	63·74	64·24	59·84	59·24	63·34	57·44	57·64	69·24	64·74	60·04	71·04	62·24
Average, ...	69·15	62·61	59·24	63·78	67·13	65'58	67·13	58·73	58·97	61·68	65·68	53·83	57·35	61·90	71·76	77:20	56·31	69·84

Average of years,.... 1, 2, 3, 4, 5, 15, 16, 17, 18, ... 66 34
Average of years,..... 6, 7, 8, 9, 10, 11, 12, 13, 14, ... 61·21
Difference, ... 5·13

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* The last No. of the two included within the brackets is for the year 1814 (see Journal As Soc. vol. II, 239. Climate of Nagpore).